

THE MACROPODIDAE (MARSUPIALIA) FROM THE
ALLINGHAM FORMATION, NORTHERN QUEENSLAND.
RESULTS OF THE RAY E. LEMLEY EXPEDITIONS, PART 2.

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ABSTRACT

The fossil Macropodidae from the Bluff Downs fauna of the Allingham Formation, northern Queensland, of lower Pliocene age, are described. Eight taxa have been recognized, although inconclusive evidence exists to suggest that additional taxa may be defined when broader collections become available. Potoroines are currently unknown and sthenurines are very poorly represented. Macropodines predominate. Four species are new, *Troposodon bluffensis*, *Protemnodon shewini*, *Macropus (Prionotemnus) narada* and *M. (Osphranter) pavana*.

Two species, *M. (P.) dryas* and *T. minor* are known also from the Chinchilla Sand, although the latter species has a wide temporal range being well represented in Pleistocene deposits. The occurrence none the less supports the previously ascribed late Pliocene age for the Chinchilla Sand.

STHENURINAE

Sthenurus sp.
(Plate 23, fig. 1)

MATERIAL EXAMINED: F9104, partial, isolated right M³ (breadth 12.6).

A preliminary statement on the fauna from the Allingham Formation and the definition of the Formation are provided in Archer and Wade (1976). The unit is regarded as being of lower Pliocene age because it is overlain in part by the Allensleigh 'flow' of the Nulla Basalt, dated radiometrically at between 4 and 4.5 M.y. This then represents a minimal age for the Formation, although from what is already known of the fauna, actual time of deposition was probably not much earlier. Continuing investigation of the deposits has been made possible through the support of Dr Ray E. Lemley as part of a joint Queensland Museum and South Dakota School of Mines project. Larger collections of macropodids have resulted, enabling the present study to be undertaken. Other groups will form the basis for additional studies.

The deposits are considered to be of great importance and they represent only the second Pliocene, mammal-bearing site in Queensland. The reasonably precise minimal age and the known diversity of the fauna suggest that results will assume some significance in correlation of Australian lacustrine and terrestrial deposits.

All measurements throughout are in millimetres.

DISCUSSION: Only one fragmentary tooth of *Sthenurus* Owen has been recovered from the Allingham Formation. Its morphology suggests that it is an M³. Insufficient features are preserved for more than generic determination to be attempted. However, of species currently known, the tooth is believed to be from a form close to *Sthenurus antiquus*, described by Bartholomai (1963) from the late Pliocene Chinchilla Sand. Ornamentation and height of the lophs is similar, although in the Allingham specimen, the strength of the ridge which ascends into the median valley from the metacone is considerably weaker than in the maxilla of *S. antiquus* figured by Bartholomai (1963, fig. 10). As in *S. antiquus*, the base of the crown is swollen posteriorly and the low midlink is positioned above the centre of the median valley. However, the strong ridge curving posterolingually from the hypocone overlaps, rather than meets, the weaker ridge from the metacone.

Although upper teeth are unknown in *S. notabilis* Bartholomai, also from the late Pliocene Chinchilla Sand (Bartholomai 1963), size and crown height would preclude this species from close relationships with the Allingham specimen.

Among Pleistocene species of *Sthenurus* reviewed by Bartholomai (1963) and Tedford (1966), or described by Merrilees (1965, 1967), the Allingham specimen appears to be within the size range of *S. oreas* De Vis, but has less pronounced accessory ridging. *S. orientalis* Tedford of comparable size, is known only from its lower dentition, while *S. occidentalis* Glaucert, *S. brownei* Merrilees and *S. gilli* Merrilees are all smaller species.

MACROPODINAE

Troposodon minor (Owen, 1877) (Plate 23, figs. 2-4)

Sthenurus minor Owen, 1877, pp. 352-61, pl. 37, figs. 1-3, pl. 38, figs. 1-4.

Troposodon minor (Owen); Bartholomai, 1967, pp. 23-32, figs. 1-3 (synonymy).

MATERIAL EXAMINED: F9046, isolated left P_3 ; F9047, isolated partial left M_2 ; F9048, isolated partial left M_3 ; F9049, isolated left DP^3 ; F9050, isolated right M_1 ; F9051, isolated left DP^3 ; F9052, isolated partial right M_1 ; F9053, isolated partial right M_1 .

DISCUSSION: The genus *Troposodon* Bartholomai is currently represented in Australian Upper Cainozoic deposits by two species, *T. minor* (Owen) and *T. kenti* Campbell. Of these, *T. minor* is by far the most commonly recorded species, being present in sufficient numbers in collections from the Darling Downs deposits to enable Bartholomai (1967) to assess the populations statistically.

Within the Darling Downs deposits, Bartholomai (1967) has shown *T. minor* to be present in both the Pleistocene fluvial deposits and the Chinchilla Sand of late Pliocene age. Samples were compared using Student's *t* Test and no significant size or morphological features were found to justify separation. Turnbull and Lundelius (1970) have also suggested that an isolated, partial lower molar, MNV-P26422, from the post-early Pliocene fossil soil deposits at Grange Burn, Hamilton, Victoria, may represent *T. minor*, a possibility which cannot be discounted on the basis of the description provided.

T. kenti from the ?early Pleistocene Katipiri Sands, has been distinguished from *T. minor* by Campbell (1973) on the basis of its larger size,

TABLE 1: MEASUREMENTS FOR *Troposodon minor* (OWEN, 1877)

Specimen	P_3	M_1	M_2	M_3	DP^3
F9046	12.8x5.1	—	—	—	—
F9047	—	—	—x9.3	—	—
F9048	—	—	—	—x10.2	—
F9050	—	11.0x6.9	—	—	—
F9053	—	—x7.3	—	—	—
F9049	—	—	—	—	10.2x8.1
F9051	—	—	—	—	10.7x7.0

supported by the less ornamented nature of the apical shelves of the molar teeth and minor morphological differences in the premolars. Representation of material larger than *T. minor* in the Chinchilla Sand material, but insufficient for description, was noted by Bartholomai (1967). No additional material has as yet been recovered to support or refute the suggestions by Campbell (1973) that these specimens may represent *T. kenti* in the Chinchilla Sand, or that they may reflect extreme variation in *T. minor*.

Although the sample available from the Allingham Formation is small, comprising only isolated teeth, a reasonable range of dental morphology is represented and some variation within the population is observable. Measurements for this material appear in Table 1.

Slight size differences which are evident between teeth from the Allingham Formation and those from the Chinchilla Sand are attributable to the small sample size in the former and the fact that the Chinchilla Sand sample itself is a relatively small one for statistical purposes. Nevertheless, the Allingham sample falls within limits which one would expect for the Chinchilla Sand sample, based on large sample assessments for macropodines provided in Bartholomai (1971, 1973, 1975). Structurally, the Allingham sample generally presents coarser accessory ridging in anterior molars and in DP^3 than is usual in Darling Downs specimens, but this feature is variably present in some individuals from the Darling Downs, including the juvenile specimen figured by Bartholomai (1967, fig. 2).

No differences are therefore present which enable separation of the Allingham material from *T. minor*, although *T. kenti* is clearly excluded by both size and morphological considerations. This is of particular interest because of the age of the Allingham Formation, which indicates a minimal temporal spread for *T. minor* from at least the mid Pliocene to the late Pleistocene, the longest recognisable range for an Australian marsupial species.

***Troposodon bluffensis** sp. nov.**
(Plate 23, figs. 5, 7-10)

MATERIAL EXAMINED F9054, holotype, isolated right M^4 , adult, Allingham Formation of mid Pliocene age, Bluff Downs Station, Allingham Creek.

In addition, F9055, an isolated left M_4 ; F9056, a partial isolated left M^4 ; F9057, an isolated right M_4 ; F9058, an isolated right P_2 and F9059, an isolated left P^3 have been used in the description of the species.

SPECIFIC DIAGNOSIS: A small species of *Troposodon*, much smaller than *T. minor*; P^3 small, with low longitudinal crest; upper molars lacking a forelink or with this present in very incipient form, and lacking a ridge from the paracone to the labial extremity of the anterior cingulum; midlink high with major contribution from near midpoint of metaloph crest. P_2 small, low crowned, markedly L-shaped; lower molars with reduced accessory ridging on apical shelf and with base of crown swollen posteriorly without production of posterior cingulum.

DESCRIPTION: Upper dentition known only from P^3 and M^4 .

P^3 elongate, subrescenscentic in basal outline, with labial margin concave and lingual convex, broader posteriorly than anteriorly; longitudinal crest low, more elevated posteriorly than anteriorly, moderately concave labially, transected by three, weak sets of vertical labial and lingual ridges, these becoming weaker posteriorly. Apex of paracone about one-fifth distance along crown from anterior limit. Hypocone moderately low, positioned posterolingual to metacone and connected to it by strong descending ridge; weak ridge curves posterolabially to meet extremely weak posterior ridge from metacone near base of crown, without production of posterior fossette; strong anterior ridge from hypocone ascends to form well-defined lingual cingulum to point opposite paracone; cingulum sinuous in lingual view, converging only slightly anteriorly in occlusal view; lingual basin broad, smooth. Anterior ridge from paracone extending well anteriorly; base of crown slightly swollen anterolingually.

M^4 small, subrectangular in basal outline, slightly constricted across median valley; lophids low, moderately bowed anteriorly, with metaloph narrower than protoloph. Anterior cingulum low,

moderately broad, anteriorly broad convex, nearly flat in labial moiety, but ascending slightly lingually; forelink absent or present in very incipient form; labial margin of cingulum unconnected to paracone by accessory ridge; midlink high, strong, curving posterolabially from protocone, then curving posteriorly abruptly to unite with strong ridge from near midpoint of crest of metaloph; junction marked by shallow cleft. Weak ridge ascends posterolingually from paracone towards midlink, defining unornamented apical shelf; median valley shallowly U-shaped, transversely flattened, with lingual extremity marked by low ridge; strong ridge curves posterolabially from hypocone towards base of crown; weaker ridge from metacone ascends to disappear below ridge from hypocone with production of posterolabial indentation; accessory ridges from hypocone and metacone ascend across posterior face of metaloph to unite near midline, defining unornamented apical shelf. Base of crown narrowly swollen posteriorly, this separated below by shallow groove.

Lower dentition known only from P_2 and M_4 .

P_2 relatively small, subrescenscentic in occlusal view, slightly broader posteriorly than anteriorly; longitudinal crest relatively low, markedly L-shaped, being flexed lingually in its posterior extension. Anterior cuspid set posteriorly at about one-half distance along crown from anterior margin, with anterior ridge from cuspid angled anteriorly and marked by low cusplule about one-half distance to crown base; low, anterolabial cingulum developed from this cusplule to unite with labial ridge from anterior cuspid. Longitudinal crest transected by two weak sets of vertical labial and lingual ridges; lingual extension of crest descends slightly to posterolingual cuspid, this having strong posterior ridge and stronger anterior ridge descending from it. Base of crown swollen lingually and labially.

M_4 small, subrectangular in basal outline, moderately strongly constricted across talonid basin; lophids low, moderately strongly convex posteriorly, with protolophid broader than hypolophid. Trigonid basin moderately broad, its length approximately equalling distance between lophids. Forelink high, strong, curving anterolingually from protoconid across trigonid to point on anterior cingulum labial to midline; anterior cingulum moderately high, broad, rounded anterolabially, more angular anterolingually, descending markedly labially and lingually from forelink; strong accessory ridge curves anterolabially from metaconid towards forelink,

*Named for Bluff Downs Station, the property on which the Allingham Formation occurs.

TABLE 2: MEASUREMENTS FOR *Troposodon bluffensis* SP. NOV.

Specimen	P ³	M ⁴	P ₂	M ₄
F9054, holotype	—	11.7×8.5	—	—
F9056	—	—×9.1	—	—
F9055	—	—	—	12.0×8.2
F9057	—	—	—	12.7×8.2
F9058	10.6×5.1	—	—	—
F9059	—	—	7.0×3.5	—

defining apical shelf; weak accessory ridges present on apical shelf, descending anteriorly from near protolophid crest. Talonid basin narrowly U-shaped, descending slightly labially and lingually from midlink. Midlink strong, moderately high, curving slightly anterolingually from hypoconid to near midpoint of posterior of protolophid; slight ridge curves towards midlink from entoconid without production of apical shelf. Base of crown swollen posteriorly but without production of posterior cingulum.

DISCUSSION: Although at present known from a very small sample comprising only isolated cheek teeth, the material is so distinct both in its size and morphology as to conclusively justify its separation as a distinct species of *Troposodon* Bartholomai within the Allingham Formation.

Compared with the Chinchilla Sand sample of *T. minor* (Owen) of late Pliocene age, the Allingham material falls well below the lower observed limits for size in equivalent teeth and, indeed, is well below the statistical limits for that population. The morphological distinction of molars in *T. bluffensis* lies in the greater simplicity of links and accessory ornamentation and in the more generalized basic structure overall.

The P₂ is more complex anteriorly and anterolabially than in *T. minor*, but it has more subdued ridging associated with the longitudinal crest. Ridges from the posterolingual cuspid, especially the anterior ridge, are stronger and better-defined. The upper permanent premolar is less triangular in basal outline than in *T. minor*.

That two species of *Troposodon* should be represented within the Bluff Downs deposits is not surprising, taking into account the macropodine representation within other fossil and recent faunas and the fact that the Allingham Formation reflects both fluvial and lacustrine sedimentation (Archer and Wade 1976) with attendant wide sampling of endemic and derived specimens.

It is considered likely that in view of its more generalized nature, *T. bluffensis* stands closer to the ancestral form from which *Troposodon* was derived than do either *T. minor* or *T. kenti*.

In addition to the material here referred to *T. bluffensis*, there exists an isolated right P₃, F9060, figured in Plate 23, fig. 8, which may belong with this species. The tooth is clearly of the *Troposodon* type, having the posterior extension of its longitudinal crest acutely angled lingually, giving the tooth a marked L-shaped appearance in occlusal view. It differs from P₃ in *T. minor* in being shorter (10.1×5.2) and in having its anterior margin near vertical. Although the longitudinal crest is lower anteriorly than posteriorly, the crown is relatively high in comparison with *T. minor* and with the P₂ referred to *T. bluffensis*. While it is considered highly unlikely that a further species of *Troposodon* is represented in the Allingham Formation, the specimen is maintained as doubtfully referred to *T. bluffensis* until more complete mandibular material is collected to confirm its taxonomic position.

Petrogale sp. (Plate 23, fig. 6)

MATERIAL EXAMINED: F7794, isolated left M₂; F7795, isolated right M₃; F9043, isolated left M₂; F9044, isolated left M₄; F9045, isolated left M₂.

DISCUSSION: The isolated molars here referred to *Petrogale* sp. were regarded by Archer in Archer and Wade (1976) as c.f. *Thylogale* sp., but were not figured. *Petrogale* and *Thylogale* are difficult to separate on the basis of isolated cheek teeth, particularly molars. However, it appears that *Petrogale* molars are more like those in *Macropus* than are those in *Thylogale*. In *Thylogale*, the lophids are very narrow longitudinally, even towards the crown base, while transversely, the lophid crests are more rectilinear. The midlinks are angled more anterolingually from the hypoconid in *Thylogale*.

In size, the referred sample is similar to *P. penicillata*, but insufficient is known of the morphology of the Allingham sample to justify more discrete treatment at this time.

The isolated right DP₃, F7785, mentioned by Archer in Archer and Wade (1976) as being difficult to distinguish from corresponding teeth in *Thylogale* (e.g. *T. stigmatica*) does show greater morphological similarity to *Thylogale* than to *Petrogale*. Rather than promote additional speculation, its position is left doubtful until more

TABLE 3: MEASUREMENTS FOR *Petrogale* SP.

Specimen	M ₂	M ₃	M ₄
F7794	6.2x4.1	—	—
F7795	—	7.1x4.1	—
F9043	6.3x4.1	—	—
F9044	—	—	8.2x5.2
F9045	6.9x4.1	—	—

adequate samples become available. *Thylogale* is known from post-early Pliocene deposits at Grange Burn, Hamilton, Victoria (Turnbull and Lundelius 1970).

***Protemnodon snewini** sp. nov.**

(Plate 24, figs. 1-4; Plate 25, fig. 1)

Protemnodon sp. Archer 1976 (partim), pp. 390-1, pl.57a.

MATERIAL EXAMINED: F9061, holotype, right mandibular ramus with I₁, P₃-M₄, adult, Allingham Formation of mid Pliocene age, Bluff Downs Station, Allingham Creek.

This specimen is possibly associated with the partial skull, F9074, and a partial, disarticulated skeleton, F9075, all located close to one another at the same stratigraphic level within the deposits.

In addition, F7810, a partial right maxilla with M¹-M² shattered M³-M⁴, adult; F7809, an isolated left M³; F9067, an isolated, partial right M₄; F7788, an isolated left P²; F9068, an isolated right M₃; F7811, an isolated right M⁴; F9069, an isolated right M¹; F9070, a partial, isolated left P₃; F9071, an isolated left M³; F9072, an isolated left P²; F9073, an isolated right P²; F7786, a right P₃, aged; F9062, an isolated right P³; F9063, an isolated partial right M₄; F9064, an isolated right M₁; F9065, an isolated left M₃; F9066, isolated partial left M³; F7824, an isolated right P₂; have been used in the description of the species.

SPECIFIC DIAGNOSIS: A small species, generally smaller than *P. anak*. Mandible comparatively very shallow with an elongate symphysis ascending at about 10° to base of mandible; lateral groove extends to below posterior root M₃; mental foramen close to diastemal crest about one-quarter distance along diastema from anterior root P₃. Condyle reduced transversely.

I₁ shallow. Check tooth row slightly bowed labially in occlusal view. P₃ narrow, elongate, slightly longer than M₄; crown low, with straight longitudinal crest transected by four sets of slightly anteriorly directed labial and lingual,

ridges. Lower molars slightly constricted across talonid basin, with lophids low, links labiad to mid-line; lingual moiety of trigonid unswollen; anterior cingulum broad, extended anterolingually into distinct, subangular corner to crown; talonid broadly U-shaped; posterior cingulum poorly developed.

P² elongate, with longitudinal crest low, transected by three or four sets of vertical labial and lingual ridges; lingual cingulum well developed, with shallow lingual basin narrowing slightly anteriorly. P³ narrow, elongate, slightly constricted basally at posterior one-third; longitudinal crest nearly straight, low, transected by three or four sets of vertical labial and lingual ridges; lingual cingulum very low, continuing to anterior of crown base, sinuous; lingual basin very narrow, shallow. Upper molars with low lophs, unconstricted, or slightly constricted across median valley in posterior molars; strong ridge ascends from paracone to limit of broad, flat, anterior cingulum; midlink very low; posterior ridge from paracone very weak; metaloph relatively broad in M⁴.

DESCRIPTION: Mandible very shallow, relatively thick; base of symphysis ascending anteriorly at an angle of approximately 10° to base of mandible; symphysis elongate, shallow, not ankylosed, rugose; geniophyal pit shallow, near posterior symphysial limit; diastema elongate with diastemal crest angular posteriorly, more rounded anteriorly; ventral margin of ramus rounded between symphysis and extremely weak diagastric ridge and process. Mental foramen small, ovate, near diastemal crest, about one-quarter distance along crest from anterior root P₃. Ramus with shallow lateral groove extending posteroventrally to below posterior root M₃, somewhat disrupted by roots of P₃; posterior of groove approximately mid-way between alveolar margin and base of ramus. Diagastric process separated from base of angle by very shallow post-diagastric sulcus, bounded above by shallow diagastric fossa. This fossa separated above from shallow, broad depression opening posteriorly into pterygoid fossa. Post-alveolar shelf short, with shelf angle reasonably well defined, leading to post-alveolar ridge ascending to disappear rapidly on medial wall of coronoid process, above large mandibular foramen. Masseteric crest low, approximately at level of alveolar margin; masseteric foramen moderately large with deep masseteric fossa. Angle of mandible broadly inflected, produced posteriorly and dorsally into crest. Anterior of coronoid process ascends posterodorsally at about

* Named for Mr W. Snewin who, with Mr J. Barrett, discovered the Allingham site.

13° from vertical. Condyle very reduced, longer than broad, planar transversely and gently convex longitudinally, supported posteriorly by narrow shelf.

I_1 elongate, deeply rooted; slightly curved in lateral view, markedly curved in occlusal view, developing subhorizontal transverse facet of wear, but gently convex wear facet longitudinally with upper incisors; mesial wear facet present along ventral margin by approximation with other lower incisor; root compressed, oval in section; crown subquadrantal in section, tapering and blade-like anteriorly, enamelled laterally, this produced dorsolabially and ventrolingually into flanges; crown slightly enamelled ventromesially.

P_2 relatively elongate, robust, moderately broad; crown subovate in basal outline with longitudinal crest secant, nearly straight but strongly flexed lingually in its posterior extension; crest transected by two sets of near vertical labial and lingual ridges with production of cuspules at crest; strength of ridges and cuspules decreases posteriorly; anterior cuspid of crest well defined; anterior of crown straight, with ridge from anterior cuspid curving lingually towards base of

crown; lingual base of crown swollen; broad, short, vertical, basal ridge present posterolabially.

DP_3 is not preserved.

P_3 elongate, narrow, deeply rooted; crown subovate in basal outline with longitudinal crest secant, slightly sinuous, and slightly flexed lingually in its posterior extension; crest transected by four sets of slightly anteriorly directed labial and lingual ridges, with production of cuspules at crest; strength of ridges and cuspules decreases posteriorly; anterior cuspid of crest well defined, but posterior cuspid less well developed; anterior of crown straight, near vertical extending well anterior to anterior root; labial base of crown slightly swollen, but not as strongly as posterior moiety of lingual base.

$M_1 < M_2 < M_3 < M_4$; molars subrectangular in basal outline, slightly to markedly constricted across talonid basin; lophids low, slightly convex posteriorly with hypolophid broader than protolophid in M_1 and M_2 , approximately equal in M_3 and narrower in M_4 . Trigonid basin broad, its length approximately equalling distance between lophids. Forelink low, moderately strong, curving slightly anterolingually from protoconid across

TABLE 4: MEASUREMENTS FOR MANDIBLES OF *Protemnodon snewini* SP. NOV.

Specimen	I_1 depth	P_2	P_3	M_1	M_2	M_3	M_4
F9061, holotype	—x10.6	—	15.0x4.9	9.8x6.6	12.3x8.3	13.3x9.3	13.8x9.0
F7824	—	8.7x4.7	—	—	—	—	—
F9065	—	—	—	—	—	12.8x8.6	—
F9067	—	—	—	—	—	—	—x8.5
F9068	—	—	—	—	—	13.2x8.7	—
F9070	—	—	—x5.1	—	—	—	—
F9063	—	—	—	—	—	—	—x9.7
F9064	—	—	—	9.9x7.1	—	—	—

TABLE 5: MEASUREMENTS FOR MAXILLAE OF *Protemnodon snewini* SP. NOV.

Specimen	P^2	P^3	M^1	M^2	M^3	M^4
F9074,* (rt.)	—	15.2x6.6	9.9x8.7	—x10.4	13.1x10.9	13.5x10.5
F9074,* (lt.)	—	—	10.0x8.8	12.3x10.2	13.1x10.9	13.9x10.7
F7810	—	—	—	—	13.8x11.6	14.0x11.7
F7811	—	—	—	—	—	14.5x11.8
F9069	—	—	11.3x9.9	—	—	—
F7788	10.9x5.8	—	—	—	—	—
F9072	10.7x6.2	—	—	—	—	—
F7786	10.7x5.4	—	—	—	—	—
F7809	—	—	—	—	13.0x11.4	—
F9071	—	—	—	—	12.1x11.4	—
F9062	—	16.6x6.6	—	—	—	—
F9073	—	15.7x6.6	—	—	—	—

*Associated with holotype

trigonid to point on anterior cingulum well labiad to midline. Anterior cingulum low, broadly curved labially but produced anterolingually into well defined corner; near horizontal lingually, but descending reasonably strongly labially. Midlink low, strong, decreasing in strength in posterior molars, descending almost directly from hypoconid, anterolingually to point at base of protolophid, well labiad to midline; slight ridge descends posterolabially from metaconid. Talonid basin broadly U-shaped, descending at low angle labially and lingually from midlink; posterior cingulum poorly defined, frequently represented only by series of low tubercles.

Upper incisors and DP³ not preserved.

P² elongate, moderately narrow, robust, subovate in basal outline, somewhat broader posteriorly than anteriorly; longitudinal crest low, secant, very slightly concave labially; crest transected by three or four sets of vertical labial and lingual ridges with production of cuspsules at crest; apex of paracone positioned about one-quarter length of crown from anterior limit. Hypocone moderately strong, united to metacone by strong, high, descending anterolabial ridge; posterior ridge from hypocone curves labially to unite with posterolingual ridge ascending from metacone below crown base; shallow posterior fossette formed between this and ridge connecting posterior cusps; anterior ridge from hypocone ascends rapidly to above crown base to form low lingual cingulum, converging slightly anteriorly to position anterior to level of paracone; slight anterolingual ridge from paracone connects with anterior of lingual cingulum; cingulum in lingual view slightly sinuous. Lingual basin shallow, occasionally transected by weak extensions of ridges from longitudinal crest. Base of crown slightly tumid labially.

P³ moderately elongate, narrow, robust, subovate in basal outline, slightly constricted at posterior one-third, but otherwise with labial and lingual margins subparallel; crown with longitudinal crest low, secant, slightly concave labially; apex of paracone about one-fifth distance along crown from anterior limit; crest transected by three or four sets of near vertical labial and lingual ridges with production of cuspsules; strength of ridges decreases posteriorly. Hypocone moderately high, united to above metacone by high, strong labial ridge; strong ridge from hypocone ascends sharply labially to unite with posterolingual ridge from metacone; well defined posterior fossette developed between this and ridge connecting posterior cusps. Anterior ridge from hypocone ascends sharply to form very low lingual

cingulum, subparallel to longitudinal crest to above paracone, then curving sharply to anterior of crown; more prominent ridges from cuspsules along crest cross very shallow lingual basin to cingulum; strong ridge from paracone unites with cingulum; cingulum markedly sinuous in lingual view, moderately tuberculate. Slight anterolabial cingulum present. Base of crown very slightly tumid labially.

M¹ < M² < M³ < M⁴; molars subrectangular to subovate in occlusal view, usually slightly constricted across median valley especially in posterior molars; lophs low, slightly bowed anteriorly, with metaloph broader than protoloph in M¹, approximately equal in M³ and slightly narrower in M⁴, anterior cingulum low, broad, short, slightly descending labially; forelink absent, but variable slight ridges occasionally pass from base of protoloph towards cingulum; cingulum generally flattened anteriorly; low ridge usually descends from paracone to labial limit of cingulum; midlink very low, its strength decreasing in posterior molars, curving posterolabially from protocone to unite with weak ridge from near crest of metaloph lingual to midline above median valley. Weak ridge ascends posteriorly from paracone, then curves abruptly lingually near median valley to unite with weak, anterolingual ridge from metacone about one-half distance from midlink to labial margin. Median valley relatively narrowly V-shaped labially and lingually; base of median valley slightly ascending labially and lingually from midlink with labial moiety sometimes pocketed. Strong ridge curves posterolabially from hypocone to posterolabial base of crown, uniting with weaker ridge from metacone; this delimits very shallow posterior fossette somewhat labiad to midline.

DISCUSSION: A partial right mandibular ramus, F7812, referred to *Protemnodon* sp. by Archer in Archer and Wade (1976), has been recovered which may not be referable to *P. snewini*, being generally larger than the *P. snewini* sample. Measurements appear in Table 6. This specimen retains DP₃ and M₁ and was figured by Archer in Archer and Wade (1976, pl. 57, fig. b). The DP³, especially, is morphologically distinct from *P. chinchillaensis* and *P. devisi* from the Chinchilla Sand, in having its protolophid very restricted and with the forelink and midlink descending anteriorly and posteriorly from the protoconid. The labial base of the protolophid comprises two weak ridges uniting to ascend to the protoconid. The forelink is very high and the labial and lingual moieties of the trigonid basin

descend at high angles from this link. The first molar possesses a strong posterior cingulum, as does DP₃, and a weak accessory link is present close to the near central midlink in the lingual moiety of the talonid basin. The anterior cingulum is linked by a moderately strong connecting ridge to the metaconid. A further specimen, F9077, an isolated right M₂, also shows larger size than *P. snewini*, has the strong posterior cingulum and stronger more central links. The possibility that these specimens indicate the existence of a second species of *Protemnodon* from the Allingham Formation would not be surprising, bearing in mind the evidence of two species within the Chinchilla Sand and three within the Pleistocene deposits of the eastern Darling Downs.

It is obvious from a cursory examination of the material that *P. snewini* presents morphological features which bear comparison with *P. chinchillaensis* from the late Pliocene Chinchilla Sand (Bartholomai 1973) and *P. otibandus* from the mid Pliocene Otibanda Formation of the Bulolo Valley, Papua New Guinea (Plane 1967). *P. devisi*, also from the Chinchilla Sand, is excluded by considerations of molar size alone, but does possess permanent premolars which accord better with *P. snewini* than do those in *P. chinchillaensis* which are actually and relatively much longer in comparison with molar lengths (Figure 1). Permanent upper premolars in *P. chinchillaensis* are considerably wider teeth and are generally more robust. The lower incisors in

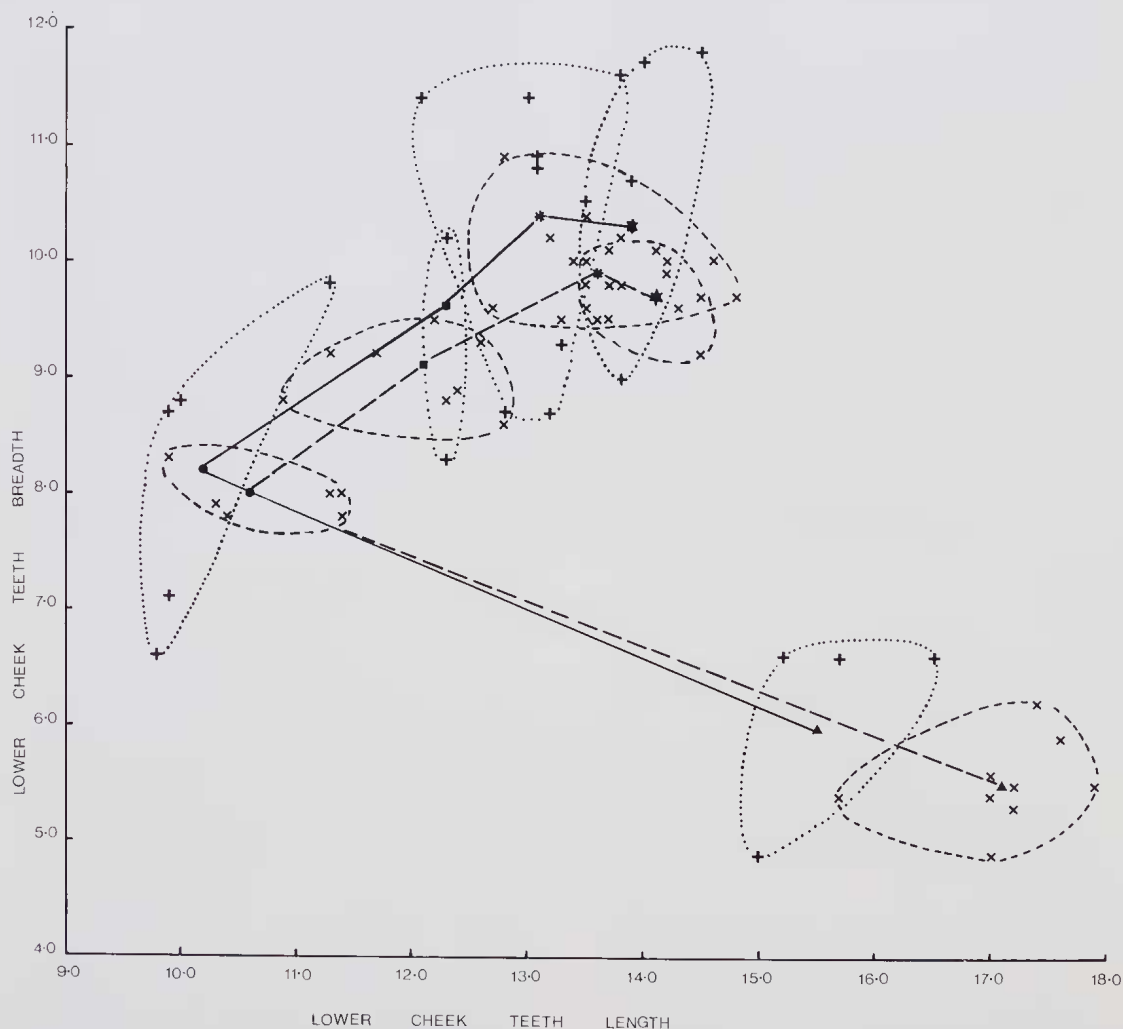


FIG. 1: Scatter diagram illustrating the proportional relationships of permanent lower cheek teeth in *Protemnodon snewini* sp. nov. (+) compared with those in *Protemnodon chinchillaensis* Bartholomai (x). Solid line links mean values from P₃-M₄ in *P. snewini*; heavy dashed line links similar mean values for *P. chinchillaensis*.

TABLE 6: MEASUREMENTS FOR *Protemnodon* sp.

Specimen	DP ₃	M ₁	M ₂
F7812	9.7×4.9	11.5×7.1	—
F9077	—	—	14.0×9.3

P. snewini are typically macropodine, whereas those in *P. chinchillanensis* (as in F7071) are considerably more spatulate. Upper molars in *P. snewini* have lower midlinks and broader metalophs on M⁴. Compared with *P. otibandus*, *P. snewini* has a shallower, longer mandibular ramus with its coronoid process less vertical and with the condyle considerably reduced transversely. The cheek tooth row is straighter, links are more labially positioned and are lower, the anterior cingulum is flatter and broader, possessing a distinct anterolingual corner, and the lower premolar is less robust. P³ in *P. otibandus* is much more robust, while in upper molars, midlinks are higher and the anterior cingulum is not as flattened as in *P. snewini*.

The left maxilla, attributed by Planc (1972) to *P. otibandus*, from the marine lower Pliocene (Kaiman) Jemmy's Point Formation, Victoria, has been suggested previously to be *P. devisi* by Bartholomai (1973). Accessory ridging in this specimen, particularly from the paracone but also from metacone into the median valley, is stronger in posterior molars than general in *P. snewini*. The Jemmy's Point specimen is larger, being comparable with dimensions in *P. devisi*.

Turnbull and Lundelius (1970) have figured and described an isolated left molariform tooth which appears referable to *Protemnodon*. This specimen, PM 4429, suggested to be a DP³ by Turnbull and Lundelius (1970) is from a fossil soil at Grange Burn, Hamilton, Victoria, dated as post-early Pliocene. Although direct comparison is impossible because DP³ is unknown in the Allingham sample, accessory ridging from the paracone and metacone into the median valley appears stronger than in *P. snewini*, while the specimen must be larger.

Associated parts of a left hind limb have been located in the Allingham excavations, indicating the possibility of recovering more complete skeletons in the deposits. Although these remains were not found with cranial specimens, it is apparent from the proportions of the metatarsal IV and the preserved elements of digit IV that they are from a species of *Protemnodon*. At this time, it can only be assumed that they are from *P. snewini*. Numerous isolated elements from the hind limbs of macropodines have been located

and, among these, several are morphologically acceptable to represent elements missing in the associated limb. These have been included in the illustration (Fig. 2) and comprise the calcaneum, cuboid, astragalus, metatarsal V and the proximal phalange of digit IV.

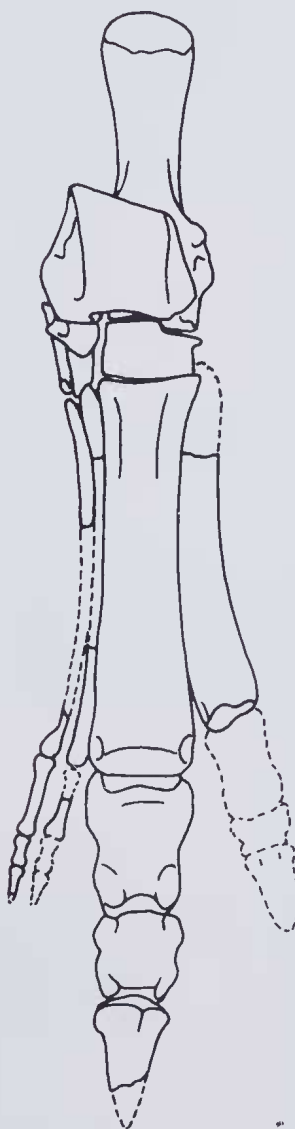


FIG. 2: Partial right pes, possibly of *Protemnodon snewini* sp. nov., all F9075, except calcaneum, cuboid, astragalus, metatarsal V and proximal phalange of digit IV, $\times\frac{1}{2}$.

The ratio of total length of metatarsal IV (102.5) to its median width (20.5) is 500. Compared with *P. otibanda*, the ratio for mt IV for which is 518, provided in Plane (1967), the bone is relatively broader than in the Awe material. The median phalanx in digit IV is 26.0 long by 23.9 broad, somewhat larger than in *P. otibanda* and relatively broader.



FIG. 3: Tibia and fibula, possibly of *Protetnodon snewini* sp. nov., F9075, associated with pes illustrated in Fig. 2, $\times 1/4$.

The most remarkable feature in the preserved, associated part of the hind limb, is the structure of the tibia which, as shown in Fig. 3, is highly curved mesially. While slight displacement, particularly along fractures in the distal moiety of the bone, tends to emphasize this feature, the tibia is much more curved than in other macropodines. Whether the specimen is aberrant cannot be ascertained at this time but a pathological cause is suspected.

Macropus (Prionotemnus) narada sp. nov.
(Plate 25, figs. 2-3)

MATERIAL EXAMINED. F9105, holotype, partial left maxilla with DP³-M¹, P³ missing, juvenile, Allingham Formation of mid Pliocene age, Bluff Downs Station, Allingham Creek.

In addition, F9106, isolated left DP³; and F9107, isolated right M³ have been used in the description of the species.

SPECIFIC DIAGNOSIS: A relatively small species. Upper molars and DP³ with well-defined forelink and strong anterior ridge from paracone to anterolabial margin of anterior cingulum; fine, relatively weak ridge passes posterolingually from paracone towards mid-point of labial moiety of median valley; midlink high, strong, with major contribution from near mid-point of hypoph crest.

DESCRIPTION: Known only from upper molariform and molar cheek teeth.

DP³ relatively small, molariform, subovate in basal outline, slightly constricted across median valley; lophs moderately high, anteriorly bowed, with metaloph broader than protoloph. Anterior cingulum relatively high and broad, short, ascending at moderate angle lingually; strong forelink present between cingulum and base of protoloph below mid-line; strong, high ridge ascends anteriorly from paracone to anterolabial margin of anterior cingulum; slight ridge curves posterolingually from paracone into median valley. Strong, high ridge curves posterolabially from protocone across median valley as midlink to unite with strong ridge from near middle of metaloph crest. Median valley ascends labially and lingually from midlink; valley sharply V-shaped. Strong ridge ascends posterolabially from hypcone to meet much weaker, posterior ridge from metacone near base of crown. Posterior fossette developed below midline.

M¹ and M³ preserved; molars subrectangular in basal outline, slightly constricted across median valley, with metaloph broader than protoloph in M¹ but slightly narrower in M³; lophs moderately

high, anteriorly bowed. Anterior cingulum relatively high, often broad, short, ascending at moderate angle lingually; strong forelink present at midline, very strong, high ridge ascends anteriorly from paracone to anterolabial margin of anterior cingulum. Relatively weak ridge ascends posterolingually from paracone towards median valley; variable, weak ridge from metacone ascends into median valley; strong, high ridge curves gently anterolabially from protocone to unite with short, high ridge from near centre of metaloph crest as midlink. Median valley sharply V-shaped, ascending slightly labially and lingually from midlink. Strong ridge curves posterolabially from hypocone to unite with weak, posterior ridge from metacone near base of crown; slight fossette formed at midline.

DISCUSSION. Although only represented in the Allingham Formation by a very small sample of maxillary remains, *Macropus (Prionotemnus) narada* sp. nov. is quite distinct from *M. dryas*, the other possible *Prionotemnus* present in the deposits. *M. dryas* lacks the well-defined and strong ridge which ascends from the paracone to the anterolabial limit of the anterior cingulum, present in *M. narada*. It also lacks the accessory ridges ascending posteriorly from the paracone and sometimes anteriorly from the metacone. Within the Chinchilla Sand, the only recorded *Prionotemnus* is *P. palankarinnicus* Stirton, first described from the Pliocene Mampurdu Sands of the Tirari Desert, South Australia. Upper molars of this species, studied in the collections of the University of California, Berkeley, lack forelinks, but possess the strong anterior ridge from the paracone to the anterior cingulum.

Compared with the recorded Pleistocene species from the fluviatile deposits of the eastern Darling Downs, *M. narada* is generally slightly larger than individuals within *M. agilis siva* (De Vis) and is about the same size as *M. thor* (De Vis), both of which were revised in Bartholomai (1975). Morphologically, the teeth are closer to those in *M. agilis siva* but possess a much better-developed forelink. The forelink in *M. thor* is subdued and accessory ridges into the median valley from the paracone and metacone are lacking. The anterior cingulum is near-planar in the labial moiety. Upper teeth in other Pleistocene species, *M. gouldi* (Owen) and *M. piltonensis* Bartholomai are unknown at this time.

The lower first molar, F7784, recorded and figured by Archer in Archer and Wade (1976, pl. 57, fig. f) may relate to *M. narada*. It is unlike any other macropodid recovered from the

Allingham Formation and, purely by elimination, and its close occlusal relationships with the upper molars described here, could well indicate the morphology to be expected in the lower molars of *M. narada*. Until it is certain that only two species of *M. (Prionotemnus)* are present in the Allingham, its taxonomic position must remain in doubt.

TABLE 7: MEASUREMENTS FOR *Macropus (Prionotemnus) narada* SP. NOV.

Specimen	DP ³	M ¹	M ²	M ³
F9105, holotype	9.1×7.2	10.1×7.9	—	—
F9106	9.0×7.1	—	—	—
F9107	—	—	—	12.5×9.0

Macropus (?*Prionotemnus*) *dryas*

(De Vis, 1895)

(Plate 26, fig. 6; Plate 27, figs 1–3)

Halmaturus dryas De Vis, 1895, pp.109–11, pl. 17, figs. 11–5.

Macropus (Prionotemnus) dryas (De Vis): Bartholomai, 1975, pp.229–32, pl. 25, figs. 1–4 (synonymy).

Macropus sp. c.f. *M. dryas* (De Vis): Archer in Archer and Wade, 1976, p.391, pl. 57, figs. c-d.

MATERIAL EXAMINED F7823, partial right mandibular ramus with I₁, P₂–M₁, P₃ excavated, juvenile (figd. Archer, 1976, pl. 57, figs. c–d). F9078, isolated right M₂; F9079, isolated right M₃; F9080, isolated partial left M₂; F9081, isolated left M₃; F9082, isolated right M₂; F9083, partial isolated left M₁; F9084, isolated left P₃; F7828, isolated left P₃; F7780, partial left maxilla with M²–M³, juvenile; F7781, isolated left P₃; F9085, partial left mandibular ramus with M₁–M₃, aged; F9086, partial right mandibular ramus with P₃–M₄, adult; F9087, partial right mandibular ramus with M₂, juvenile; F9088, partial left mandibular ramus with base of I₁, P₃–M₁, juvenile; F9089, partial left mandibular ramus with M₃–M₄, adult; F9090, isolated left M₃; F9091, isolated right P₂; F9092, isolated partial right M₃; F9093, isolated partial left M₂; F9094, isolated left M₂; F9096, isolated right DP₃; F9097, isolated right P₃; F9098, isolated partial right M₂; F9103, isolated left M¹; F9095, isolated partial left DP₃; F9099, isolated right M₂; F9100, isolated partial left M¹; F9101, isolated partial right DP₃; F9102, isolated left P₃; F7790, isolated right P₂; F7782, partial right mandibular ramus with M₁–M₃, juvenile; F7783, isolated right P₃; F7791 isolated left P₂.

DISCUSSION: The sample of *Macropus* (?*Prionotemnus*) *dryas* (De Vis) from the

Allingham Formation is numerically the largest among macropodids from the deposits, suggesting that this species was the most abundant grazing herbivore in the fauna. Bartholomai (1975) revised *M. dryas*, previously recorded only from the late Pliocene Chinchilla Sand in the western Darling Downs, where the species was well represented but not dominant within the assemblage present.

Observed measurements for cheek teeth in the Allingham sample often fall towards the lower observed limits or even outside the lower limits of comparable teeth in the Chinchilla Sand material. No other morphological differences are evident which might be considered significant in

the separation of the Allingham Formation sample from that in the Chinchilla Sand. With the larger sample now available, the possible structural distinctions noted by Archer in Archer and Wade (1976) are considered to be within the range of variation for *M. dryas*, or are likely to be encountered in the species, bearing in mind the variation exhibited by modern species of *Macropus* (Bartholomai 1971).

Two specimens, F7790 and F7791, have been referred to *M. dryas*, both of which are P². This tooth was not present in the available Chinchilla Sand material at the time of Bartholomai's (1975) revision. These possess a single vertical set of labial and lingual ridges transecting the

TABLE 8: MEASUREMENTS FOR MANDIBLES OF *Macropus* (?*Prionotemnus*) *dryas* (DE VIS, 1895)

Specimen	P ₂	DP ₃	P ₃	M ₁	M ₂	M ₃	M ₄
F7823	8.5x3.8	8.8x5.0	11.3x4.0	9.9x6.5	—	—	—
F9078	—	—	—	—	12.0x7.2	—	—
F9079	—	—	—	—	11.6x7.0	—	—
F9080	—	—	—	—	—x8.3	—	—
F9081	—	—	—	—	12.5x8.0	—	—
F9082	—	—	—	—	11.9x7.1	—	—
F9085	—	—	—	8.8x6.3	10.0x7.6	12.2x8.2	—
F9086	—	—	11.3x3.9	9.1x5.7	11.0x—	12.7x8.0	13.8x8.1
F9087	—	—	—	—	11.5x—	—	—
F9088	—	—	10.5x3.6	8.7x5.9	—	—	—
F9089	—	—	—	—	—	12.4x8.2	13.4x8.3
F9090	—	—	—	—	—	13.0x8.4	—
F9091	7.6x3.9	—	—	—	—	—	—
F9092	—	—	—	—	—	—x8.3	—
F9093	—	—	—	—	—x7.9	—	—
F9094	—	—	—	—	12.2x7.5	—	—
F9096	—	8.6x4.3	—	—	—	—	—
F9097	—	—	11.7x4.2	—	—	—	—
F9095	—	8.0x4.4	—	—	—	—	—
F9099	—	—	—	—	11.9x7.7	—	—
F9101	—	—x4.5	—	—	—	—	—
F9102	—	—	11.4x3.9	—	—	—	—
F7782	—	—	—	—	11.7x—	13.6x7.7	—
F7783	—	—	11.2x4.0	—	—	—	—

TABLE 9: MEASUREMENTS FOR MAXILLAE OF *Macropus* (?*Prionotemnus*) *dryas* (DE VIS, 1895)

Specimen	P ²	DP ³	P ³	M ¹	M ²	M ³	M ⁴
F9084	—	—	13.7x6.0	—	—	—	—
F7828	—	—	13.8x6.4	—	—	—	—
F7780	—	—	—	—	11.1x9.3	11.8x9.4	—
F7781	—	—	13.3x6.3	—	—	—	—
F9103	—	—	—	10.3x7.9	—	—	—
F9100	—	—	—	—x8.2	—	—	—
F7790	8.2x5.4	—	—	—	—	—	—
F7791	8.3x5.1	—	—	—	—	—	—

longitudinal crest, have a low hypocone and a variably present lingual cingulum. This structure can be reasonably well developed compared with the situation in P^3 where it is represented only by a series of low tubercles closely adpressed to the base of the longitudinal crest.

Macropus (Osphranter) pavana sp. nov.
(Plate 26, figs. 1-5)

MATERIAL EXAMINED: F9108, holotype, partial left maxilla with $DP^3=M^1$, P^3 missing, juvenile, Allingham Formation of mid Pliocene age, Bluff Downs Station, Allingham Creek.

In addition, F9109, a partial left mandibular ramus with M_2-M_4 , adult; F9110, isolated right M^2 ; F9111, isolated right M_2 ; F9112, isolated right M^1 ; F9113, isolated right P^3 ; F9114, isolated right P^3 ; F9115, isolated right M^2 ; F9116, isolated left P_3 ; F9117, isolated left M_3 ; F7773, isolated right M_3 ; have been used in the description of the species.

SPECIFIC DIAGNOSIS: A relatively small species with deep ramus, relatively narrow below anterior cheek teeth; P_3 relatively elongate with trenchant longitudinal crest transected medially by single set of vertical labial and lingual ridges and with crest slightly curving lingually posteriorly. Lower molars with midlink well labiad to midline; hypolophid with variable oblique groove. DP^3 with high secant ridge from paracone to anterolabial limit of anterior cingulum; forelink strong; accessory link present mid-way between midlink and labial margin of median valley. P^3 with longitudinal crest slightly cleft at anterior one-third and with single medial set of vertical labial and lingual ridges transecting crest; hypocone very low; posterolingual fossette and lingual cingulum very reduced, cingulum degenerating to series of tubercles anteriorly. Molars with relatively strong forelinks; anterior molars with slight accessory link mid-way between midlink and labial margin of median valley; this is variably absent in posterior molars.

DESCRIPTION: Upper incisors, P^2 , M^3 and M^4 not preserved.

DP^3 molariform, subovate in basal outline, slightly constricted across median valley, with metaloph much broader than protoloph. Lophs high, slightly convex anteriorly. Anterior cingulum moderately high, narrow, short, with well-defined forelink well linguad to mid-line from base of protoloph to cingulum; cingulum near planar, labiad to forelink, ascending at very high

angle lingually. Strong high ridge ascends anteriorly from paracone to anterolabial margin of cingulum as secant crest. Well-defined, high, strong ridge ascends posterolabially from protocone across median valley as midlink, uniting with ridge from near mid-point of metaloph, below median valley; relatively strong ridge ascends posteriorly from paracone towards median valley, producing slight accessory link across floor of valley mid-way between midlink and labial margin. Valley narrowly V-shaped labially and lingually, near planar transversely. Strong ridge ascends posteriorly from hypocone, curving labially to near posterolabial margin of crown, uniting with slight posterior ridge from metacone; fossette present at midline. Base of crown swollen slightly labially and lingually.

P^3 relatively large, subovate in basal outline, broader posteriorly than anteriorly; high, relatively short, longitudinal crest transected by median set of vertical labial and lingual ridges with production of cuspule at crest; slight cleft present along crest about one-third distance from anterior cusp. Hypocone very low, connected to metacone by weak anterolabial ridge; stronger ridge curves posterolabially to meet posterolingual ridge from metacone, defining shallow posterolingual fossette; anterior ridge from hypocone ascends abruptly forming low cingulum posterolingually, this degenerating anteriorly into basal tubercles, lingual basin very restricted.

$M^1 < M^2$; molars subovate in basal outline, very slightly constricted across median valley; lophs high, somewhat rotated with metaloph crest more convex anteriorly than protoloph in unworn teeth; metaloph broader than protoloph in anterior molars. Anterior cingulum relatively high, narrow, short; well-defined forelink present linguad to mid-line, between base of protoloph and equally well-developed, short, transverse ridge across cingular shelf. Labial moiety of cingular shelf near planar, lingual moiety ascending at high angle from forelink; slight ridge ascends anteriorly from paracone to anterolabial margin of cingulum. Strong, high ridge curves posterolabially from protocone to unite with strong ridge from near centre of hypoloph as midlink; posterior ridge from paracone very reduced; low accessory link developed across median valley and mid-way between midlink and labial margin, this occasionally lacking by M^2 ; median valley near planar transversely, sharply V-shaped longitudinally. Anterior ridge from metacone to accessory link very weak in M^1 , sometimes lacking by M^2 . Strong, slightly flared ridge curves posterolabially from hypocone to posterolabial base of crown,

there uniting with weak posterior ridge from metacone; fossette developed at mid-line; base of crown usually slightly swollen.

Mandible imperfectly known. Ramus deep, relatively narrow below anterior cheek teeth; post-alveolar shelf elongate with angle poorly developed; ventral margin of ramus rounded posterior to symphysis; diagastric ridge and process very weak; diagastric process separated from base of angle by very shallow post-diagastric sulcus, bounded above by very shallow diagastric fossa; this fossa separated above from broad shallow depression opening posteriorly into pterygoid fossa; mandibular foramen large; masseteric crest raised to about level of occlusion of cheek teeth.

Lower incisor, P_2 and DP_3 are unknown.

P_3 relatively elongate, subovate in basal outline, somewhat broader posteriorly than anteriorly. Longitudinal crest trenchant with anterior cuspid well-defined but with posterior cuspid less well-defined; crest ascends posteriorly, being transected mesially by set of weak, vertical, labial and lingual ridges with production of low cuspile at crest. Posterior extension of crest curves very slightly lingually before descending to crown base. Anterior surface from anterior cuspid near vertical. Base of crown narrowly swollen labially, lingually and anteriorly.

$M_1 < M_2 < M_3 < M_4$; molars subovate to subrectangular in basal outline, slightly constricted across talonid basin; lophids high, convex posteriorly, somewhat anteriorly rotated in labial view, with hypolophid broader than protolophid in M_1 and M_2 and slightly narrower in M_3 and M_4 . Trigonid basin relatively broad, its length approximately equalling distance between lophids. Forelink high, strong, curving anterolingually from protoconid across trigonid basin to point labiad to mid-line on high anterior cingulum; trigonid basin slopes labially and lingually from forelink and posteriorly from cingulum; anterior cingulum more expanded anterolingually; very slight ridge descends anteriorly from metaconid; slight anterolabial fossette formed in trigonid. Midlink high, strong, curving anterolingually from hypoconid to unite with well-developed ridge from protoconid above talonid basin; junction occasionally markedly flexed; variable, high, accessory ridge present running anterolingually from hypoconid part of midlink. Talonid basin narrowly V-shaped labially, broadly U-shaped lingually, slightly descending labially and lingually from midlink; floor of talonid sometimes with low transverse fold labially and lingually from midlink. Posterior of hypolophid with moderate,

near-vertical groove, rarely pocketed towards its base, flanked by low, vertical ridges. Crown somewhat flexed about labial extremity of talonid basin.

DISCUSSION: Taxonomic separation of species of *Macropus* Shaw is frequently extremely difficult on the basis of dental morphology alone and normally, single characters are of little use for this purpose. This certainly is true of the material from the Allingham Formation, here referred to *Macropus (Osphranter) pavana* sp. nov.

Archer in Archer and Wade (1976) correctly assigned part of the material to *M. (Osphranter)* suggesting it should be compared with *M. woodsi* Bartholomai (1975) a species from the Chinehilla Sand with which *M. pavana* has obviously close relationships. With the larger sample now available as a result of subsequent collecting, separation of the material from *M. woodsi* and from *M. (Osphranter) pan* De Vis, 1895, also from the late Pliocene Chinehilla Sand has been possible.

M. pavana is smaller than *M. pan* and has its P_3 relatively narrower, with a lower hypcone and much reduced lingual cingulum and basin. Development of an accessory link across the median valley in upper molars appears restricted to M^1 and sometimes M^2 whereas this structure frequently occurs in incipient form in posterior molars in *M. pan*. P_3 is similar in these species, but that in *M. pavana* lacks the prominent posterolingual cuspile present in *M. pan*. Compared with *M. woodsi*, in which the upper permanent premolar has yet to be described, *M. pavana*, is of similar size but upper molars lack well-defined accessory links across the median valleys of posterior molars. P_3 is larger than in *M. woodsi*, and rather than possessing a trifid, crescentic longitudinal crest, has a much straighter, trenchant structure. Lower molars possess a stronger midlink which includes a much greater contribution from near the protocone and the posterior surface of the protolophid.

Three isolated premolars from the Allingham Formation mentioned by Archer in Archer and Wade (1976) as resembling *M. (Osphranter)* have been assigned elsewhere within *Macropus* in this paper, with the exception of F7789, which is clearly of the *M. (Osphranter)* type. This specimen has a bifid, more curved longitudinal crest than in the referred P_3 of *M. pavana*. It also possesses an anterolingual ridge from the posterior cuspid. It is possible that additional *M. (Osphranter)* species may be present in the Allingham

TABLE 10: MEASUREMENTS FOR MAXILLAE OF *Macropus (Osphranter) pavana* SP. NOV.

Specimen	DP ³	P ³	M ¹	M ²
F9108, holotype	10.2×7.5	—	11.9×9.8	—
F9110	—	—	—	13.2×10.7
F9113	—	9.8×5.6	—	—
F9114	—	9.3×5.7	—	—
F9112	—	—	10.4×8.5	—
F9115	—	—	—	12.6×9.6

TABLE 11: MEASUREMENTS FOR MANDIBLES OF *Macropus (Osphranter) pavana* SP. NOV.

Specimen	P ₃	M ₁	M ₂	M ₃	M ₄
F9109	—	—	13.9×9.2	16.2×10.7	17.4×10.0
F9116	8.6×5.0	—	—	—	—
F9111	—	—	13.7×8.6	—	—
F9117	—	—	—	16.4×10.1	—
F7773	—	—	—	—×10.3	—

Formation, and whether this specimen reflects extreme variation in *M. pavana* or whether it represents an additional taxon must remain unresolved until further collections are forthcoming from the deposits.

CONCLUSIONS

Comparison of the macropodids from the Allingham Formation with those from other Pliocene deposits in Australia is largely limited by the nature of other occurrences, the extent to which faunal elements have been researched and the lack of diversity in the faunas yet reported. The notable exception is the Chinchilla Sand in the western Darling Downs, south-eastern Queensland, a formation believed to be of late Pliocene age. This provides a substantial basis for comparison, although other deposits in Victoria and in the Tirari Desert of central Australia give tantalizing glimpses of elements present in those parts of the continent in Pliocene times. The Awe fauna in Papua New Guinea (Plane 1967) contains taxa which also warrant attention in this regard. An undescribed, presumably Pliocene fauna from Merriwah in New South Wales contains reasonable diversity and will prove interesting for comparison when study on it has been completed.

The Macropodidae from the Chinchilla Sand were studied originally by De Vis (1895). Progressive revisions of the different taxa represented appear in numerous papers by Bartholomai (1963, 1966, 1967, 1973a, 1973b,

1976). A total of 11 macropodid species has been recorded, although as with the Bluff Downs fauna, fragmentary remains suggest the presence of additional forms. Among sthenurines, the most common species is *Sthenurus antiquus*. *Troposodon minor*, *Protemnodon chinchillaensis*, *P. devisi*, *Macropus (Osphranter) pan*, *M. (O.) woodsi* and *M. (?Prionotemnus) dryas* are very common among the Macropodinae. Other macropodids are present in relatively low numbers. Similar to the Allingham Formation, potoroines have yet to be located.

The only macropodids common to both faunas are *T. minor* and *M. (? P.) dryas*. Of these, *T. minor* is known from wide temporal and geographical ranges and is not considered particularly useful in correlation. *M. (? P.) dryas*, however, has been recorded previously only from the Chinchilla Sand. This fact, taken in conjunction with the known minimal age for the Allingham Formation, the presence of a presumably more primitive *Troposodon* in those sediments and the general similarities of the taxa where comparisons are possible, is supportive of the late Pliocene age currently attributed to the Chinchilla Sand. Close relationships are apparent between Chinchilla and Allingham diprotodontids (Archer 1976).

Detailed comparisons have been provided within the text above with taxa described from other Australian and Papua New Guinea deposits. For the most part, conclusions other than taxonomic cannot be drawn at this time.

Although it is apparent that grazing macropodids predominated in the assemblage present in the Allingham Formation, suggesting that open sclerophyll and open grasslands habitats were present in the area during deposition, detailed palaeoecological assessment should await results of studies on other groups represented.

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PLATE 23

- FIG. 1A-B: *Sthenurus* sp., F9104, stereopair of occlusal view of partial right M^2 , $\times 2$.
- FIG. 2A-B: *Troposodon minor* (Owen), F9051, stereopair of occlusal view of isolated right DP^3 , $\times 2$.
- FIG. 3A-B: *Troposodon minor* (Owen), F9046, stereopair of occlusal view of isolated left P_3 , $\times 2$.
- FIG. 4A-B: *Troposodon minor* (Owen) F9050, stereopair of occlusal view of isolated right M_1 , $\times 2$.
- FIG. 5A-B: *Troposodon bluffensis* sp. nov., F9058, lateral and stereopaired occlusal views of isolated right P_2 , $\times 2$.
- FIG. 6A-B: *Petrogale* sp., F7794, stereopair of occlusal view of isolated left M_2 , $\times 2$.
- FIG. 7, 7A-B: *Troposodon bluffensis* sp. nov., F9057, lateral and stereopaired occlusal views of isolated right M_4 , $\times 2$.
- FIG. 8, 8A-B: ? *Troposodon bluffensis* sp. nov., F9060, lateral and stereopaired occlusal views of isolated right P_3 , $\times 2$.
- FIG. 9, 9A-B: *Troposodon bluffensis* sp. nov., F9054, holotype, lateral and stereopaired occlusal views of isolated right M^4 , $\times 2$.
- FIG. 10, 10A-10B: *Troposodon bluffensis* sp. nov., F9059, lateral and stereopaired occlusal views of isolated left P_2 , $\times 2$.

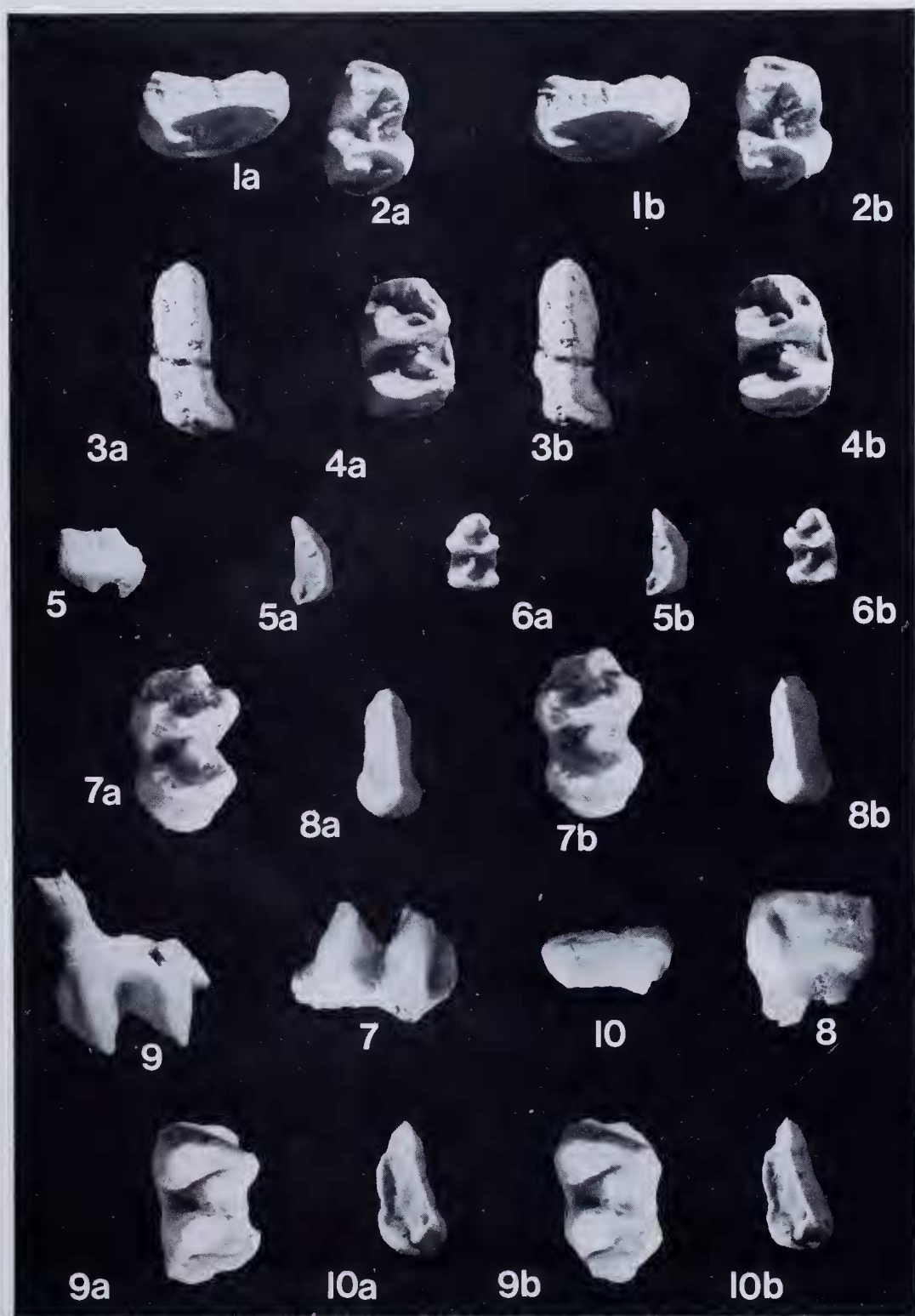


PLATE 24

- FIG. 1, 1A-B: *Protemnodon snewini* sp. nov., F9074, lateral view $\times\frac{1}{2}$ and stereopaired occlusal views $\times 1$ of partial adult skull.
- FIG. 2, 2A-B: *Protemnodon snewini* sp. nov., F7788, lateral and stereopaired occlusal views of isolated left P^2 , $\times 2$.
- FIG. 3, 3A-B: *Protemnodon snewini* sp. nov., F7824, lateral and stereopaired occlusal views of isolated right P_2 , $\times 2$.
- FIG. 4: *Protemnodon snewini* sp. nov., F9061, holotype, lateral view of right mandibular ramus, $\times\frac{1}{2}$.

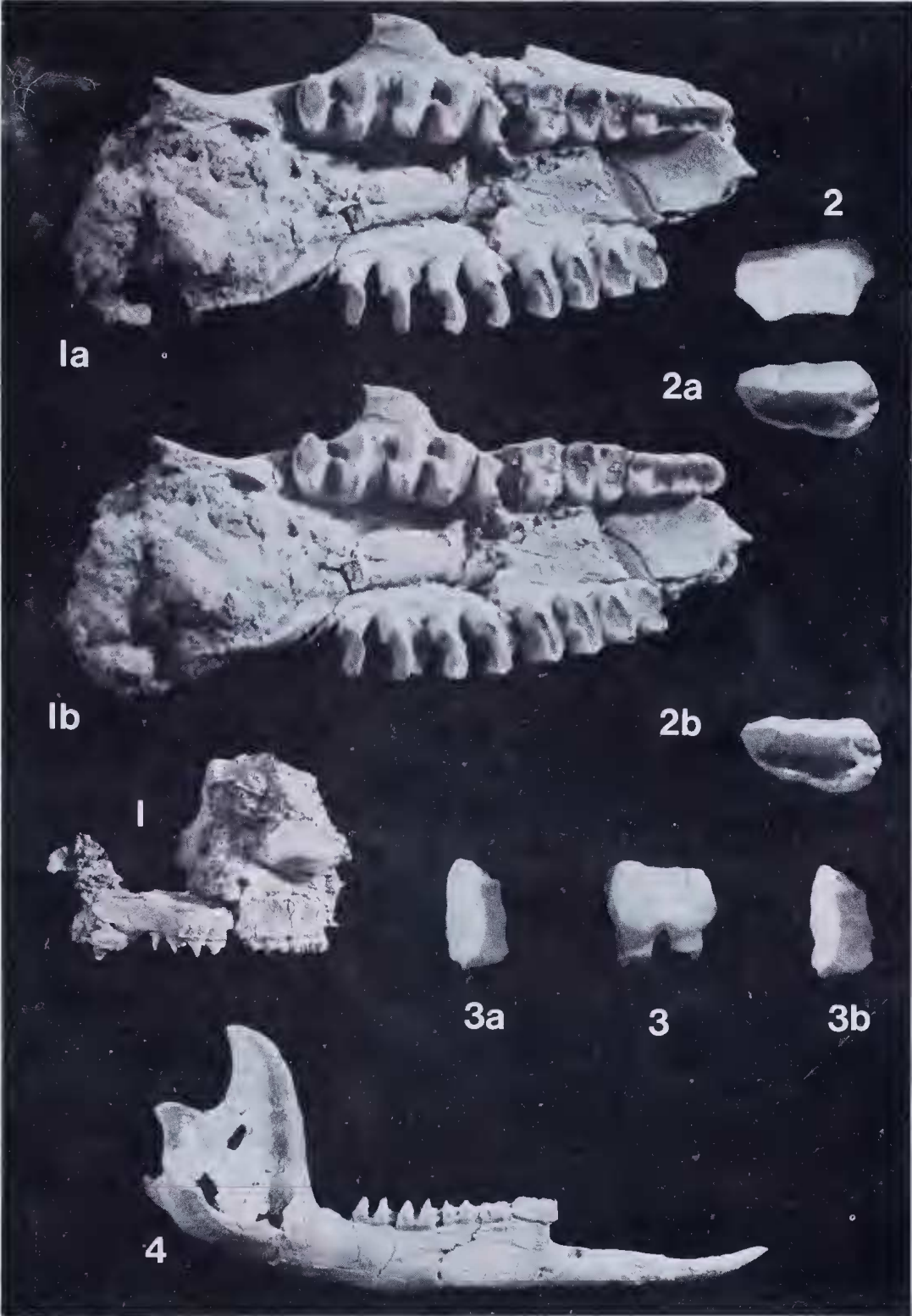


PLATE 25

- FIG. 1A-B: *Protemnodon snewini* sp. nov., F9061, holotype, stereopair of occlusal view of right mandibular ramus with I₁, P₃-M₄, ×1.
- FIG. 2, 2A-B: *Macropus (Prionotemnus) narada* sp. nov., F9105, holotype, lateral and stereopaired occlusal views of partial left maxilla with DP³-M¹, ×1.
- FIG. 3, 3A-B: *Macropus (Prionotemnus) narada* sp. nov., F9107, lateral and stereopaired occlusal views of isolated right M³, ×2.

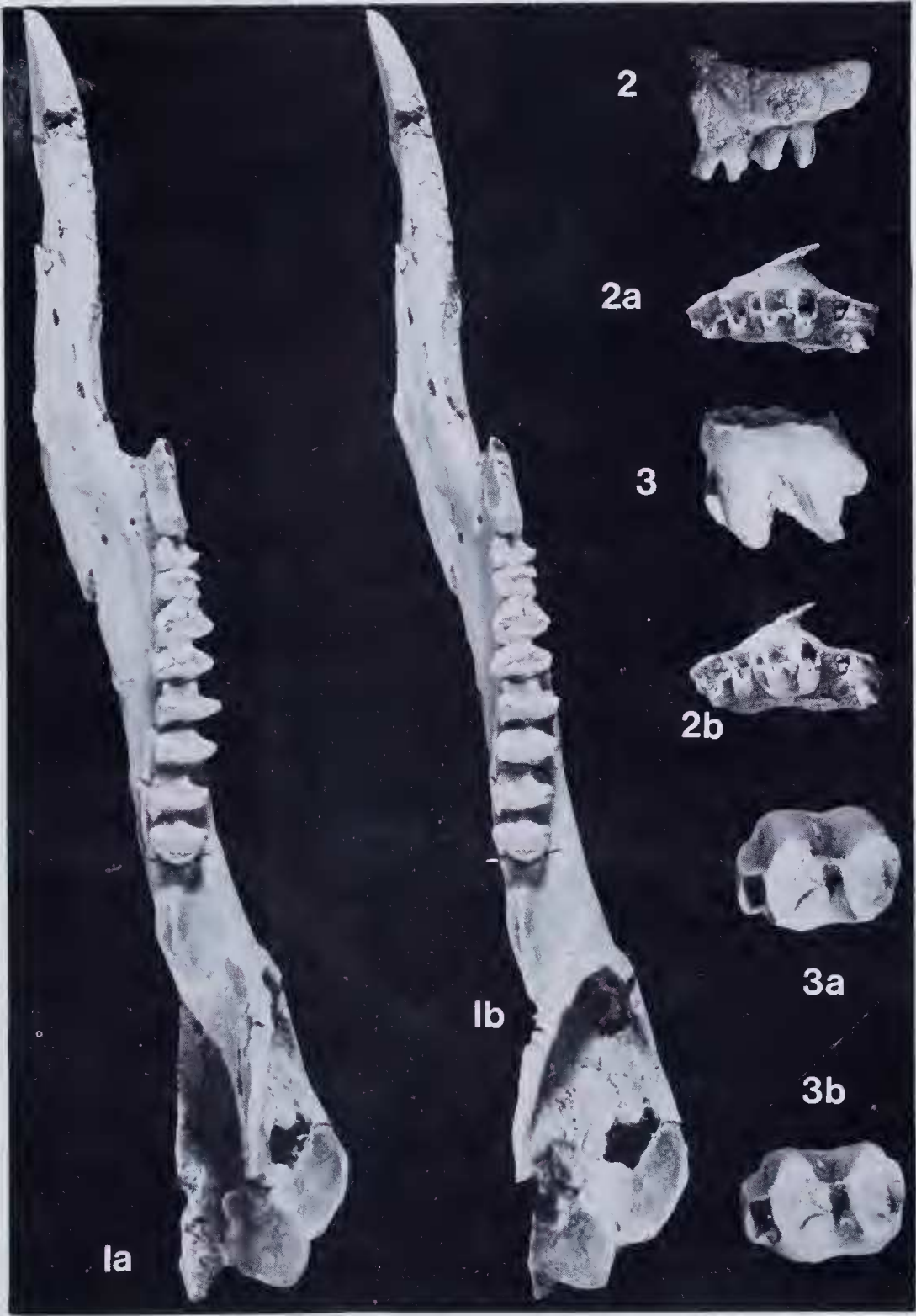


PLATE 26

- FIG. 1, 1A-B: *Macropus (Osphranter) pavana* sp. nov., F9108, holotype, lateral and stereopaired occlusal views of partial left maxilla with DP³-M¹, $\times 1$.
- FIG. 2, 4A-B: *Macropus (Osphranter)* sp., F7789, lateral and stereopaired occlusal views of isolated left P₃, $\times 2$.
- FIG. 3, 2A-B: *Macropus (Osphranter) pavana* sp. nov., F9114, lateral and stereopaired occlusal views of isolated right P³, $\times 2$.
- FIG. 4, 3A-B: *Macropus (Osphranter) pavana* sp. nov., F9116, lateral and stereopaired occlusal views of isolated left P₃, $\times 2$.
- FIG. 5, 5A-B: *Macropus (Osphranter) pavana* sp. nov., F7773, lateral and stereopaired occlusal views of isolated right M₃, $\times 2$.
- FIG. 6, 6A-B: *Macropus* (? *Prionotemnus*) *dryas* (De Vis), F9084, lateral and stereopaired occlusal views of isolated left P³, $\times 2$.

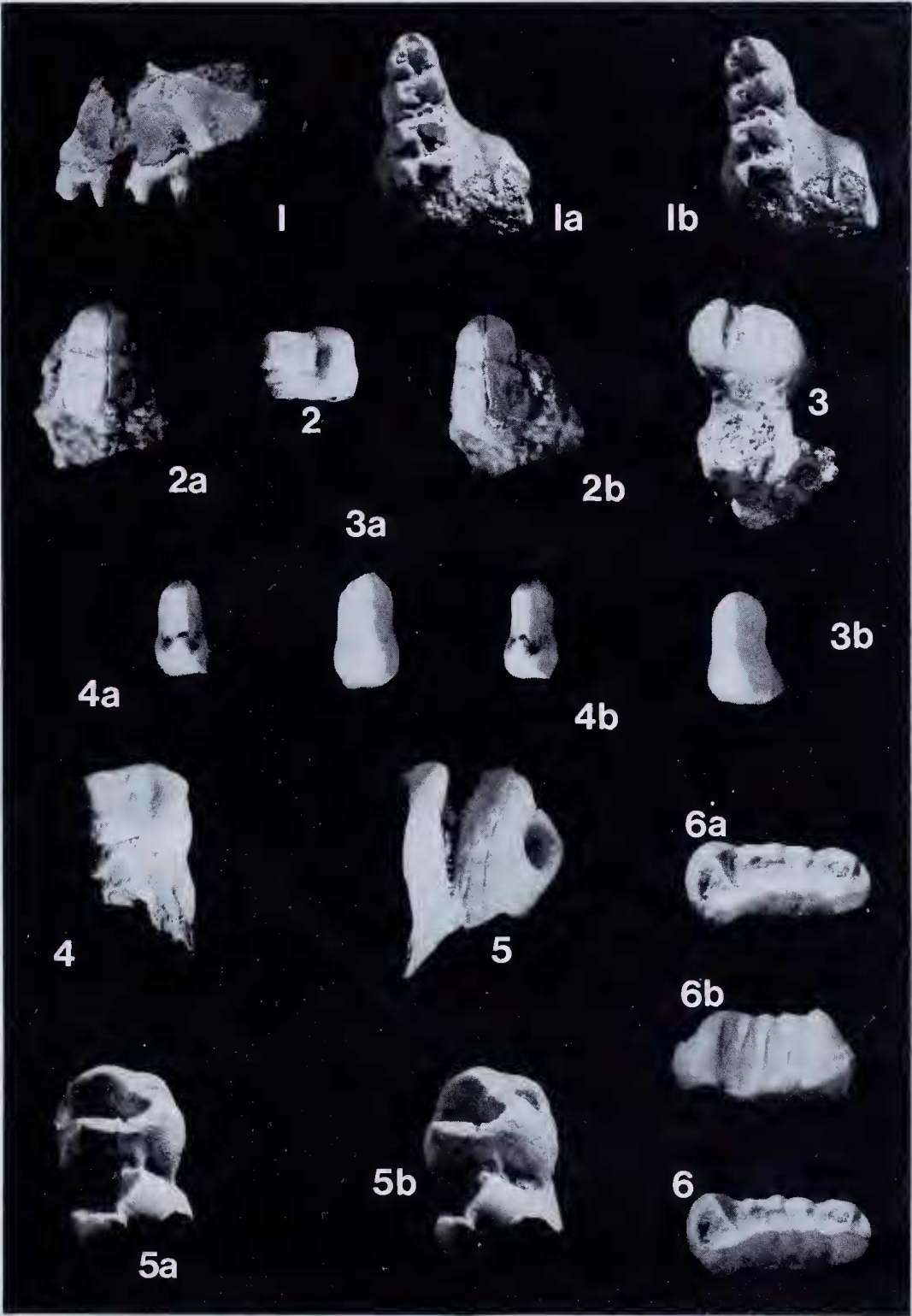


PLATE 27

- FIG. 1, 1A-B: *Macropus* (? *Prionotemnus*) *dryas* (De Vis), F9086, lateral and occlusal views of partial right mandibular ramus with P₃-M₄, $\times 1$.
- FIG. 2, 2A-B: *Macropus* (? *Prionotemnus*) *dryas* (De Vis), F7780, lateral and stereopaired occlusal views of partial left maxilla with M²-M³, $\times 1$.
- FIG. 3, 3A-B: *Macropus* (? *Prionotemnus*) *dryas* (De Vis), F7790, lateral and stereopaired occlusal views of isolated right P², $\times 2$.

